EPA/ROD/R04-88/039
1988

EPA Superfund
Record of Decision:

NATIONAL STARCH & CHEMICAL CORP.
EPA ID: NCD991278953
OU 01
SALISBURY, NC
09/27/1988

- DETERMINE THE NATURE AND EXTENT OF GROUNDWATER, SURFACE WATER, SOIL, AND SEDIMENT CONTAMINATION ON AND ADJACENT TO THE SITE.

- DETERMINE THE ATTENTUATIVE AND ADSORPTIVE PROPERTIES OF THE SHALLOW SATURATED MEDIA.

- DETERMINE AND DESCRIBE ON-SITE AND OFF-SITE FEATURES THAT COULD AFFECT THE METHODS OF CONTAINMENT OR CLEANUP.

- DETERMINE THE EXTENT TO WHICH THE SITE POSED AN IMMINENT HAZARD TO PUBLIC HEALTH OR THE ENVIRONMENT.

THE PURPOSE OF THE FEASIBILITY STUDY WAS TO DEVELOP AND EXAMINE REMEDIAL ALTERNATIVES FOR THE SITE, AND TO SCREEN THESE ALTERNATIVES ON THE BASIS OF PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT, COST-EFFECTIVENESS AND TECHNICAL IMPLEMENTABILITY. IN ACCORDANCE WITH THE COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION AND LIABILITY ACT OF 1980 (CERCLA), AS AMENDED BY THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 (SARA), ALTERNATIVES IN WHICH TREATMENT WOULD PERMANENTLY AND SIGNIFICANTLY REDUCE THE VOLUME, TOXICITY, OR MOBILITY OF THE HAZARDOUS SUBSTANCES AT THE SITE WERE PREFERRED OVER THOSE ALTERNATIVES NOT INVOLVING SUCH TREATMENT.

2.0 ENFORCEMENT ANALYSIS

THE NATIONAL STARCH SITE WAS PROPOSED FOR INCLUSION TO THE NPL IN APRIL 1985 AND EPA ASSUMED LEAD RESPONSIBILITY FOR THE SITE AT THAT TIME. THE CURRENT OWNER AND OPERATOR, NATIONAL STARCH AND CHEMICAL CORPORATION AGREED TO PERFORM THE RI/FS. A NOTICE LETTER WAS SENT TO NATIONAL STARCH ON MAY 30, 1986.NEGOTIATIONS FOR THE RI/FS CONSENT AGREEMENT WERE CONCLUDED WITH THE SIGNING OF THE DOCUMENT BY BOTH EPA AND NATIONAL STARCH ON DECEMBER 1, 1986.

3.0 CURRENT SITE STATUS

3.1 HYDROGEOLOGIC SETTING

THE GEOLOGIC FRAMEWORK OF ROWAN COUNTY FORMS TWO DISTINCT AQUIFERS. THE FIRST IS A SHALLOW AQUIFER CREATED BY THE SAPROLITE. THE SECOND IS A BEDROCK AQUIFER FORMED BY THE CRYSTALLINE ROCKS. THE TWO AQUIFERS ARE INTERCONNECTED WITH THE CLAY-RICH SAPROLITE AQUIFER ACTING AS A STORAGE RESERVOIR FOR THE LOWER CRYSTALLINE ROCK AQUIFER. AS A RESULT, BOTH THE UPPER AND LOWER AQUIFERS CAN BE CONSIDERED UNCONFINED DESPITE THE TENDENCY OF WATER LEVELS WITHIN THE CRYSTALLINE ROCK AQUIFER TO DISPLAY ARTESIAN CONDITIONS. WATER LEVELS WITHIN THE DEEP AQUIFER TEND TO RISE TO LEVELS NEAR THE UPPER WATER TABLE ACROSS THE COUNTY, INDICATING A HYDRAULIC CONNECTION BETWEEN THE TWO.

WELL YIELDS ARE LOW WITHIN THE UPPER AQUIFER AND TEND TO RANGE BETWEEN 3 TO 5 GALLONS PER MINUTE. SUCCESSFUL WELLS DRILLED WITHIN THE BEDROCK AQUIFER GENERALLY HAVE HIGHER YIELDS THAN THOSE IN THE SAPROLITE AQUIFER AND AVERAGE APPROXIMATELY 40 TO 50 GALLONS PER MINUTE.

GRANTS CREEK DELINEATES THE WESTERN MOST PROPERTY LINE AND FLOWS IN A NORTHEASTERLY DIRECTION. GRANTS CREEK FLOWS APPROXIMATELY 12 MILES BEYOND THE NATIONAL STARCH PROPERTY BEFORE REACHING THE YADKIN RIVER. IT JOINS THE YADKIN RIVER APPROXIMATELY 2 MILES BELOW THE WATER SUPPLY INTAKE FOR THE CITY OF SALISBURY. SHEET SURFACE RUNOFF, CONCENTRATED TOWARD THE MIDDLE OF THE FORMER TRENCH AREA, CARRIES SURFACIAL DRAINAGE FROM THE TRENCH AREA.

THREE UNNAMED TRIBUTARIES OF GRANTS CREEK TRAVERSE THE NATIONAL STARCH SITE. THE FIRST STREAM PASSES WITHIN 200 YARDS OF THE FRONT OF THE PLANT (THE EASTERN TRIBUTARY), PARALLELING CEDAR SPRINGS ROAD AND LEAVES THE PROPERTY TO THE NORTH. A SMALL INTERMITTENT STREAM FORMS THE

SOUTHWESTERN SITE BOUNDARY (THE SOUTHWESTERN TRIBUTARY).THE USGS QUADRANGLE INDICATES A THIRD SMALL STREAM POSITIONED IN THE NORTHWEST QUADRANT OF THE PROPERTY (THE NORTHWEST TRIBUTARY).GRANTS CREEK AND THE UNNAMED TRIBUTARIES RECEIVE THE SURFACE WATER RUNOFF FROM THE FORMER TRENCH AREA.

3.2 SITE CONTAMINATION

THE NATIONAL STARCH SITE CONTAINS TWO MAIN IDENTIFIED CONTAMINANT AREAS: THE TRENCH AREA AND THE WASTEWATER LAGOON AREA. SOIL, GROUNDWATER, SURFACE WATER, AND SEDIMENT SAMPLES WERE COLLECTED IN AND AROUND EACH OF THE TWO AREAS AND ANALYZED. ALL SAMPLES WERE ANALYZED FOR THOSE CHEMICALS INCLUDED ON THE HAZARDOUS SUBSTANCES LIST (HSL). THESE INCLUDE ORGANIC VOLATILES, PESTICIDES, ORGANIC SEMIVOLATILES, POLYCHLORINATED BIPHENYLS (PCBS), AND METALS.

SURFACE WATER/SEDIMENT

THE SURFACE WATER SAMPLING LOCATIONS ARE SHOWN ON FIGURE 4 AND THE SEDIMENT SAMPLING LOCATIONS ARE SHOWN ON FIGURE 5.THE RESULTS OF THE ANALYSES ARE GIVEN IN TABLE 1. IN ADDITION, EPA TOOK ADDITIONAL SURFACE WATER/SEDIMENT SAMPLES FROM AN EASTERN TRIBUTARY IN RESPONSE TO NEARBY RESIDENTS' COMPLAINTS (FIGURE 6). TABLE 2 SHOWS THE RESULTS OF EPA'S SAMPLING ACTIVITIES. BOTH STUDIES REVEALED HIGH LEVELS OF CONTAMINATION IN THE EASTERN TRIBUTARY ON SITE.

THE SOURCE OF CONTAMINATION IN THE SURFACE WATER HAS NOT BEEN IDENTIFIED; NEITHER SURFACE WATER RUNOFF OR GROUNDWATER DISCHARGE HAS BEEN RULED OUT AS A POTENTIAL SOURCE. ADDITIONAL SAMPLING WILL BE CONDUCTED DURING THE SUPPLEMENTAL RI FOR THE SOIL REMEDIATION OPERABLE UNIT TO DETERMINE IF OTHER SOURCE AREA(S) EXIST ON THE NATIONAL STARCH PROPERTY, AND TO DETERMINE THE RELATED EXTENT OF MIGRATION OF CONTAMINATION. THIS SUPPLEMENTAL RI WILL OCCUR CONCURRENTLY WITH THE REMEDIAL DESIGN STAGE OF THE FIRST OPERABLE UNIT.

GROUNDWATER

DURING THE REMEDIAL INVESTIGATION, 23 MONITORING WELLS WERE INSTALLED; 17 SHALLOW WELLS TO SAMPLE WATER IN THE SAPROLITE AND SIX DEEP WELLS TO SAMPLE WATER FROM THE BEDROCK AQUIFER. LOCATIONS OF THE WELLS ARE SHOWN ON FIGURE 7 AND THE SAMPLING RESULTS ARE GIVEN IN TABLE 3.

DATA COLLECTED FROM THE GROUNDWATER WELLS INDICATED THAT THE TWO WATER-BEARING ZONES (SHALLOW AND DEEP) ARE INTERCONNECTED.

THREE AREAS WERE TARGETED FOR GROUNDWATER INVESTIGATION AT THIS SITE:THE WASTEWATER TREATMENT LAGOONS, THE AREA JUST WEST OF THE PLANT BETWEEN THE PLANT AND TRENCH AREA (WHERE SOIL FROM WASTEWATER LAGOON RETROFITTING WAS STOCKPILED AND AERATED, RELEASING VOLATILE ORGANICS TO THE ATMOSPHERE) AND THE TRENCH AREA.

THE DATA FROM THE GROUNDWATER WELLS IN THE VICINITY OF THE STOCKPILE AREA AND THE WASTEWATER TREATMENT LAGOONS DID NOT SHOW ANY IMPACT ON GROUNDWATER.

THE GROUNDWATER IN THE TRENCH AREA WAS FOUND TO BE HIGHLY CONTAMINATED. CONTAMINANTS, MOSTLY IN THE FORM OF VOLATILE AND BASE NEUTRAL ORGANICS, ARE PRESENT IN BOTH THE SAPROLITE AND BEDROCK AQUIFERS.

3.3 SUMMARY OF SITE RISKS

CERCLA DIRECTS THAT THE AGENCY MUST PROTECT HUMAN HEALTH AND THE ENVIRONMENT FROM CURRENT AND POTENTIAL EXPOSURE TO HAZARDOUS SUBSTANCES AT THE SITE. IN ORDER TO ASSESS THE CURRENT AND POTENTIAL RISKS FROM THIS SITE, A RISK ASSESSMENT WAS CONDUCTED AS PART OF THE REMEDIAL

INVESTIGATION. THIS SECTION SUMMARIZES THE AGENCY'S FINDINGS CONCERNING THE RISKS FROM EXPOSURE TO GROUNDWATER RELATED TO THIS SITE.

ELEVEN CARCINOGENS AND FOURTEEN NON-CARCINOGENS HAVE BEEN IDENTIFIED IN THE GROUNDWATER AT THIS SITE. THE TOXICITY, MOBILITY AND PERSISTENCE CHARACTERISTICS OF THESE SUBSTANCES AT THE SITE DO NOT WARRANT THE EXCLUSION OF ANY OF THESE SUBSTANCES FROM CONSIDERATION AS CHEMICALS OF CONCERN AT THIS SITE. THE SUBSTANCES OF CONCERN FOR THIS SITE ARE LISTED IN TABLE 4.THIS TABLE ALSO PRESENTS THE HIGHEST DETECTED ON-SITE LEVELS FOR THESE SUBSTANCES, AS WELL AS OTHER RELATED HEALTH INFORMATION.

3.3.1 EXPOSURE ASSESSMENT

GROUNDWATER IN THE AREA IS A CURRENT SOURCE OF DRINKING WATER; IT IS CLASSIFIED AS CLASS IIA BASED ON THE AGENCY'S GROUNDWATER CLASSIFICATION STRATEGY. A 1988 SURVEY OF EXISTING OFF-SITE WATER SUPPLY WELLS REVEALED A TOTAL OF 1,539 HOMES WITHIN A 3-MILE RADIUS OF THE SITE THAT ARE OUTSIDE THE LIMITS OF THE CITY WATER LINES AND COULD POTENTIALLY USE THE GROUNDWATER FOR DRINKING AND OTHER DOMESTIC PURPOSES. THE CLOSEST WELL IS LOCATED 2,200 FEET NORTHEAST OF THE SITE.

IN DEVELOPING THE HYPOTHETICAL EXPOSURE SCENARIOS FOR GROUNDWATER AT THIS SITE, IT WAS ASSUMED THAT NEARBY RESIDENTS WOULD BE EXPOSED TO WATER CONTAMINATED AT THE HIGHEST CONCENTRATIONS FOUND ON SITE. THIS IS A REASONABLE ASSUMPTION BASED ON THE FACTS THAT RESIDENCES ARE LOCATED ALMOST DIRECTLY ALONG THE SITE BOUNDARIES IN THE DIRECTION OF APPARENT GROUNDWATER FLOW, AND BECAUSE THE DATA INDICATE THAT THE GROUNDWATER PLUME IS ADVANCING RAPIDLY.

THE POTENTIAL ROUTES OF HUMAN EXPOSURE RELATIVE TO THE GROUNDWATER INCLUDE WATER USED FOR DRINKING AND OTHER DOMESTIC PURPOSES. RELATIVE TO THE SURFACE WATERS, THERE IS A POTENTIAL FOR HUMANS TO DIRECTLY CONTACT OR INGEST CONTAMINATED WATERS THROUGH RECREATIONAL USES OF NEARBY CREEKS.

3.3.2 TOXICITY ASSESSMENT

ELEVEN CARCINOGENS AND FOURTEEN NON-CARCINOGENS WERE IDENTIFIED IN THE GROUNDWATER AT THIS SITE. THESE SUBSTANCES ARE LISTED IN TABLE 4.FOR THE CARCINOGENS, THIS TABLE ALSO LISTS THE CONCENTRATION FOR EACH SUBSTANCE WHICH IS EQUIVALENT TO A 10(-6) RISK. THE AGENCY CONSIDERS INDIVIDUAL EXCESS CANCER RISKS IN THE RANGE OF 10(-4) TO 10(-7) AS PROTECTIVE; HOWEVER, THE 10(-6) RISK LEVEL IS USED AS THE POINT OF DEPARTURE FOR SETTING CLEANUP LEVELS AT SUPERFUND SITES. A 10(-6) LEVEL IS PARTICULARLY APPROPRIATE AS A POINT OF DEPARTURE AT THIS SITE GIVEN THE NUMBER OF CARCINOGENS THAT NEARBY RESIDENTS MAY BE EXPOSED TO FROM THE SITE.

FOR NON-CARCINOGENS, THE CONCENTRATION WHICH WOULD BE EQUIVALENT TO EITHER THE REFERENCE DOSE (RFD) OR THE ACCEPTABLE CHRONIC INTAKE (ACI) FOR THAT SUBSTANCE IS LISTED IN THAT TABLE. THE RFD AND ACI ARE LEVELS TO WHICH HUMANS CAN BE EXPOSED TO ON A DAILY BASIS WITHOUT ADVERSE EFFECT. EXPOSURES WHICH EXCEED CONCENTRATIONS EQUIVALENT TO THESE RFDS AND ACIS WOULD BE CONSIDERED AN UNACCEPTABLE RISK AT THIS SITE.

3.3.3 SUMMARY OF RISK CHARACTERIZATION

GIVEN THE PROXIMITY OF THE RESIDENTS TO THE SITE BOUNDARY (PARTICULARLY THOSE RESIDENCES IN THE KING'S FOREST SUBDIVISION AND THE LITTLE ACRES TRAILER COURT) AND THE RAPID ADVANCEMENT OF THE GROUNDWATER PLUME, THE RISKS FROM CURRENT AND POTENTIAL EXPOSURE TO CONTAMINATED GROUNDWATER FROM THIS SITE ARE UNACCEPTABLE. FUTURE OPERABLE UNITS FOR THIS SITE WILL DEAL WITH THE RISKS ASSOCIATED WITH EXPOSURE TO CONTAMINATED SURFACE WATER, SEDIMENTS, SOIL AND AIR FROM THIS SITE; THE RISKS TO HUMAN HEALTH AND THE ENVIRONMENT WILL BE FURTHER ASSESSED IN THE INVESTIGATION FOR

THOSE OPERABLE UNITS.

4.0 CLEANUP CRITERIA

4.1 GROUNDWATER

BASED ON THE RISKS TO HUMAN HEALTH DESCRIBED IN THE SECTION 3.3 ABOVE, PROTECTIVE CLEANUP GOALS MUST BE SET FOR THE CHEMICALS OF CONCERN IN THE GROUNDWATER. THE CLEANUP LEVELS FOR THESE SUBSTANCES ARE SET AT THE MAXIMUM CONTAMINANT LEVEL (MCL) OR, IF AN MCL IS NOT CURRENTLY AVAILABLE, AT THE LIMIT OF DETECTION FOR THAT SUBSTANCE. THEREFORE, THE FOLLOWING LEVELS MUST BE ACHIEVED THROUGHOUT THE PLUME(S) IN ORDER TO PROTECT HUMAN HEALTH AT THIS SITE:

ARSENIC10 PPB
BENZENES PPB
BIS (2-CHLOROETHYL ETHER)5 PPB
BROMODICHLOROMETHANE5 PPB
CHLOROFORM5 PPB
1,2-DICHLOROETHANE5 PPB
L,L-DICHLOROETHYLENE7 PPB
METHYLENE CHLORIDE5 PPB
1,1,2-TRICHLOROETHANE5 PPB
TRICHLOROETHYLENE5 PPB
VINYL CHLORIDE 2 PPB

IN ADDITION, CLEANUP GOALS ARE BEING SET FOR THE FOURTEEN NON-CARCINOGENS IDENTIFIED AT THE SITE. THESE LEVELS WILL BE SET AT THE MCL. IF AN MCL IS NOT AVAILABLE, THE LEVEL WILL BE SET AT THE RFD OR ACI EQUIVALENT CONCENTRATION LEVELS. HOWEVER, IN THE CASE OF ETHYL BENZENE, THE CLEANUP CRITERION IS BASED ON THE PROPOSED MAXIMUM CONTAMINANT GOAL WHICH IS A HEALTH-BASED GOAL THAT TAKES INTO ACCOUNT RECENT DATA. THEREFORE, THE FOLLOWING LEVELS MUST BE MET THROUGHOUT THE PLUME(S) AT THIS SITE IN ORDER TO PROTECT HUMAN HEALTH:

ACETONE3,500 PPB
BARIUM1,000 PPB
BERYLLIUM17.5 PPB
CADMIUM10 PPB
CHROMIUM50 PPB
1,2-DICHLOROPROPANE6 PPB
ETHYL BENZENE3,500 PPB
MANGANESE7,700 PPB
NICKEL350 PPB
4-NITROPHENOL350 PPB
SELENIUM10 PPB
TOLUENE2,000 PPB
XYLENES350 PPB
ZINC7,350 PPB

THE CLEANUP GOALS LISTED ABOVE FOR CARCINOGENS AND NON-CARCINOGENS WILL ALSO MEET THE CHEMICAL-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS FOR THIS SITE.

THE STATE OF NORTH CAROLINA HAS BELATEDLY IDENTIFIED GROUNDWATER CLEANUP LEVELS MORE STRINGENT THAN THOSE IDENTIFIED ABOVE. THESE CLEANUP GOALS CAN BE FOUND IN NORTH CAROLINA ADMINISTRATIVE CODE, TITLE 15, DEPARTMENT OF NATURAL RESOURCES AND COMMUNITY DEVELOPMENT, ENVIRONMENTAL MANAGEMENT DIVISION, SUBCHAPTER 2L - CLASSIFICATIONS AND WATER QUALITY STANDARDS APPLICABLE TO THE GROUNDWATERS OF NORTH CAROLINA - SECTIONS .0100, .0200 AND .0300. THE AGENCY WILL INITIATE

DISCUSSIONS WITH THE STATE TO DETERMINE IF THESE STANDARDS ARE APPLICABLE TO THE SITE. EVEN IF THESE MORE STRINGENT CLEANUP LEVELS ARE FOUND TO BE APPLICABLE, THEY WOULD NOT ALTER THE REMEDIAL ACTION SELECTED FOR THIS OPERABLE UNIT.

4.2 SURFACE WATER/SEDIMENT MONITORING

SURFACE WATER AND SEDIMENT CONTAMINATION HAVE BEEN DETECTED IN ON-SITE STREAMS IN UNACCEPTABLY HIGH CONCENTRATIONS. THE SOURCE OF THIS CONTAMINATION HAS NOT BEEN DETERMINED. A SUPPLEMENTAL RI TO SUPPORT A SOURCE CONTROL OPERABLE UNIT WILL BE CONDUCTED TO DETERMINE IF A SOURCE, OTHER THAN THE TRENCH AREA, EXISTS. IF OTHER SOURCE(S) ARE FOUND, THEY WILL BE REMEDIATED IN THE SOURCE CONTROL OPERABLE UNIT. THE GROUNDWATER EXTRACTION SYSTEM WILL BE DESIGNED TO REMEDIATE CONTAMINATED GROUNDWATER THROUGHOUT THE PLUME AND TO PREVENT OFFSITE MIGRATION OF CONTAMINATED GROUNDWATER. SURFACE WATER AND SEDIMENT SAMPLING WILL BE CONDUCTED TO DETERMINE THE SOURCE OF THE CONTAMINATION, AND TO VERIFY THAT CONTAMINATION HAS NOT MIGRATED TO OFFSITE SURFACE WATER AND SEDIMENTS.

5.0 ALTERNATIVES EVALUATION

THE PURPOSE OF THIS REMEDIAL ACTION AT THE NATIONAL STARCH SITE IS TO MITIGATE AND MINIMIZE CONTAMINATION IN THE GROUNDWATER AND TO REDUCE POTENTIAL RISKS TO HUMAN HEALTH AND THE ENVIRONMENT.

GROUNDWATER

AN INITIAL SCREENING OF POSSIBLE TECHNOLOGIES WAS PERFORMED TO IDENTIFY THOSE WHICH BEST MEET THE CRITERIA OF SECTION 300.68 OF THE NATIONAL CONTINGENCY PLAN (NCP) (TABLE 5) AND WHICH SATISFIES THE STATUTORY CRITERIA OF SARA SECTION 121.

FOLLOWING THE INITIAL SCREENING OF TECHNOLOGIES, POTENTIAL REMEDIAL ACTION ALTERNATIVES WERE IDENTIFIED AND ANALYZED. THESE ALTERNATIVES WERE FURTHER SCREENED AND THOSE WHICH BEST SATISFIED THE CLEANUP OBJECTIVES AND APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARS) WERE DEVELOPED FOR CONSIDERATION (TABLE 6).

5.1 GROUNDWATER ALTERNATIVES

ALTERNATIVE 1: NO ACTION

THIS ALTERNATIVE INCLUDES NO REMEDIAL ACTION MEASURES, BUT WILL INCLUDE CONTINUED GROUNDWATER AND SURFACE WATER MONITORING AND THE FILING OF A DEED RESTRICTION IDENTIFYING THE KNOWN AREAS OF CONTAMINATION. THE DEED RESTRICTION WILL PREVENT ON-SITE DEVELOPMENT IN THE TRENCH AREA AND PREVENT ON-SITE USE OF THE GROUNDWATER.

CONTAMINATION, OVER TIME, MAY BE REDUCED BECAUSE OF BIODEGRADATION, CHEMICAL TRANSFORMATION AND DILUTION. HOWEVER, GIVEN THE CONTAMINANT CONCENTRATIONS AT THE SITE, THE TIME REQUIRED TO SIGNIFICANTLY REDUCE CONTAMINANT LEVELS IS UNREALISTIC. NO ACTION DOES NOT PROVIDE PERMANENT GROUNDWATER REMEDIATION; PREVENT OFFSITE MIGRATION OF CONTAMINATED GROUNDWATER, SURFACE WATER, AND SEDIMENTS; OR ACTIVELY RESTORE CONTAMINATED GROUNDWATER THROUGHOUT THE PLUME. THERE ARE SHORT-TERM IMPACTS ON HUMAN HEALTH OR THE ENVIRONMENT INVOLVED IN THE IMPLEMENTATION OF THIS ALTERNATIVE.

BECAUSE THIS ALTERNATIVE WILL RESULT IN HAZARDOUS SUBSTANCES REMAINING ONSITE ABOVE HEALTH-BASED LEVELS, A 5-YEAR REVIEW PROCESS WOULD BE CONDUCTED AS DESCRIBED IN SARA SECTION 121 TO ENSURE ADEQUATE PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT.

THIS ALTERNATIVE DOES NOT MEET THE STATUTORY PREFERENCE FOR TREATMENT TO THE MAXIMUM EXTENT PRACTICABLE; NOR DOES IT MEET ARARS.

PRESENT WORTH:$220,000.00

ALTERNATIVE 2:OFF-SITE DISPOSAL OF GROUNDWATER TO RCRA TSD FACILITY

THIS ALTERNATIVE INCLUDES THE EXTRACTION OF CONTAMINATED GROUNDWATER, THE COLLECTION OF GROUNDWATER AT A CENTRAL ON-SITE LOCATION, AND THE OFF-SITE DISPOSAL OF THE COLLECTED GROUNDWATER BY BULK TANK TRUNKS TO A RCRA TREATMENT, STORAGE AND DISPOSAL (TSD) FACILITY.

GROUNDWATER WILL BE EXTRACTED AT A RATE OF 50,000 GALLONS PER DAY AND WILL BE PLACED IN AN ABOVE GROUND TANK FOR NO MORE THAN 90 DAYS. THE TANKS WILL STORE THE EXTRACTED GROUNDWATER UNTIL IT IS TRANSFERRED TO BULK TANK TRUCKS AND TRANSPORTED TO A RCRA TSD FACILITY.

CONTINUED GROUNDWATER MONITORING WILL BE PERFORMED AFTER REMOVAL OF THE CONTAMINATED GROUNDWATER TO VERIFY THE EFFECTIVENESS OF THE GROUNDWATER EXTRACTION OPERATION.

THIS ALTERNATIVE WOULD MEET GROUNDWATER REMEDIAL ACTION OBJECTIVES BY REMOVING THE CONTAMINATED GROUNDWATER BUT WILL NOT DESTROY THE CONTAMINANTS. THUS, IT IS NOT CONSIDERED A PERMANENT REMEDY. FURTHER, IT DOES NOT SATISFY THE STATUTORY PREFERENCE FOR TREATMENT TO THE MAXIMUM EXTENT PRACTICABLE.

SHORT-TERM IMPACTS TO HUMAN HEALTH AND THE ENVIRONMENT INVOLVE INCREASED TRAFFIC FROM TANKER TRUCKS. THIS ALTERNATIVE PERMANENTLY REMEDIATES THE GROUNDWATER, BUT DOES NOT SATISFY THE STATUTORY PREFERENCE FOR TREATMENT TO THE MAXIMUM EXTENT PRACTICABLE.

PRESENT WORTH:$103,623,000.00

ALTERNATIVE 3:GROUNDWATER EXTRACTION AND DISCHARGE DIRECTLY TO POTW

THIS ALTERNATIVE INVOLVES EXTRACTING THE CONTAMINATED GROUNDWATER AND DISCHARGING IT TO THE SALISBURY POTW FOR TREATMENT. THE POTW IS A 5 MILLION GALLON PER DAY BIOLOGICAL TREATMENT PLANT. BENCH-SCALE TESTING MAY BE REQUIRED BY THE POTW TO DETERMINE IF THE POTW IS CAPABLE OF TREATING THIS CONTAMINATED GROUNDWATER.

NATIONAL STARCH CURRENTLY DISCHARGES PLANT WASTEWATER EFFLUENT TO A SEWER LINE CONNECTED TO THE POTW.

THE EXTRACTED GROUNDWATER WOULD BE DISCHARGED INTO THE EXISTING SEWER LINE.

THE DISCHARGE TO THE SALISBURY POTW WILL HAVE TO BE NEGOTIATED WITH THE CITY OF SALISBURY.

GROUNDWATER WILL BE EXTRACTED UNTIL THE GROUNDWATER AT THE SITE MEETS THE ARARS ESTABLISHED FOR THIS SITE THROUGHOUT THE PLUME AREA(S).THERE ARE NO SHORT-TERM IMPACTS TO HUMAN HEALTH OR THE ENVIRONMENT FROM THIS ALTERNATIVE. LONG-TERM EFFECTS INCLUDE RESTORING CONTAMINATED GROUNDWATER ONSITE FOR POTENTIAL BENEFICIAL USE, PREVENTION OF OFFSITE MIGRATION OF CONTAMINATED GROUNDWATER, AND PREVENTION OF OFFSITE MIGRATION OF CONTAMINATED SURFACE WATER AND SEDIMENTS WHICH MIGHT BE RELATED TO GROUNDWATER DISCHARGE. THIS GROUNDWATER ALTERNATIVE MEETS THE STATUTORY PREFERENCE FOR TREATMENT TO THE MAXIMUM EXTENT PRACTICABLE AND FOR PERMANENT REMEDIATION. DISCHARGE OF EFFLUENT FROM THE POTW WILL BE IN ACCORDANCE WITH THE POTW'S NPDES PERMIT. THIS ALTERNATIVE MEETS ARARS.

PRESENT WORTH:$781,000.00

ALTERNATIVE 4: GROUNDWATER EXTRACTION, PRE-TREATMENT BY AIRSTRIPPING/METALSREMOVAL, DISCHARGE TO POTW OR TO GRANTS CREEK

IN THIS ALTERNATIVE, THE GROUNDWATER WILL BE EXTRACTED, TREATED TO MEET ACCEPTABLE EFFLUENT LIMITS OF THE POTW, ONCE NEGOTIATED, THEN DISCHARGED TO THE POTW, OR DISCHARGED TO GRANTS CREEK IN COMPLIANCE WITH A NPDES PERMIT.

THE TREATMENT PROCESS WILL INCLUDE PH ADJUSTMENT, PRECIPITATION, FLOCCULATION, AND CLARIFICATION FOR METALS REMOVAL. AIR STRIPPING WITH FUME INCINERATION FOLLOWED BY BIOTREATMENT WILL BE USED TO REMOVE THE HSL ORGANICS, AND TO REDUCE COD AND BOD. THE PROCESS WILL BE DESIGNED TO MEET ALL PRETREATMENT REQUIREMENTS FOR PRODUCING A FINAL EFFLUENT SUITABLE FOR DISCHARGE TO THE SALISBURY POTW.

THIS ALTERNATIVE HAS THE SAME SHORT AND LONG TERM IMPACTS AS ALTERNATIVE 3.THIS GROUNDWATER ALTERNATIVE MEETS THE STATUTORY PREFERENCE FOR TREATMENT TO THE MAXIMUM EXTENT PRACTICABLE AND FOR PERMANENT REMEDIATION. THIS ALTERNATIVE MEETS ARARS.

GROUNDWATER WILL BE EXTRACTED UNTIL THE GROUNDWATER AT THE SITE MEETS THE ARARS ESTABLISHED FOR THIS SITE THROUGHOUT THE PLUME AREA(S).

PRESENT WORTH:$7,104,000.00

ALTERNATIVE 6:GROUNDWATER EXTRACTION. PRE-TREATMENT IN EXISTING LAGOON SYSTEM, DISCHARGE TO POTW

THIS ALTERNATIVE INCLUDES THE EXTRACTION OF GROUNDWATER AND PRETREATMENT AS REQUIRED TO ALLOW THE GROUNDWATER TO BE COMBINED WITH THE CURRENT PLANT EFFLUENT PRIOR TO TREATMENT AND TREATED IN THE EXISTING LAGOONS FOR DISCHARGE TO THE SALISBURY POTW. THE LEVEL OF PRETREATMENT REQUIRED WILL DEPEND ON THE EFFLUENT LIMITS SET BY THE POTW.

THE PRETREATMENT SYSTEM MAY INCLUDE METALS REMOVAL BY LIME PRECIPITATION, STRIPPING OF VOLATILE ORGANICS, OR TREATMENT WITH ACTIVATED CARBON. IF STRIPPING OF VOLATILE ORGANICS IS REQUIRED, AIR MONITORING WILL BE INSTITUTED, AND CARBON FILTER UNITS USED AS NECESSARY TO ADDRESS POTENTIAL AIR EMISSIONS. ACTIVATED CARBON USED TO PREVENT AIR EMISSIONS OR AS A TREATMENT PROCESS FOR CONTAMINATED GROUNDWATER WILL BE INCINERATED OR REGENERATED, WHICHEVER IS MOST COST-EFFECTIVE.

THIS ALTERNATIVE HAS THE SAME SHORT AND LONG TERM IMPACTS AS ALTERNATIVE 3.THIS GROUNDWATER ALTERNATIVE MEETS THE STATUTORY PREFERENCE FOR TREATMENT TO THE MAXIMUM EXTENT PRACTICABLE AND FOR PERMANENT REMEDIATION. THIS ALTERNATIVE MEETS ARARS.

GROUNDWATER WILL BE EXTRACTED UNTIL THE GROUNDWATER AT THE SITE MEETS THE ARARS ESTABLISHED FOR THIS SITE THROUGHOUT THE PLUME AREA(S).

PRESENT WORTH:$3,036,000.00

6.0 RECOMMENDED ALTERNATIVES

6.1 COMPARISON OF ALTERNATIVES

ALTERNATIVE 1, NO ACTION ALTERNATIVE WHICH MUST BE CONSIDERED AS A BASE LINE FOR COMPARISON (SARA SECTION 121), DOES NOT MEET ARARS, AND DOES NOT SATISFY THE STATUTORY CRITERIA, NOR TO THE EXTENT PRACTICABLE, THE NCP. ALTERNATIVE 2, PROVIDES FOR REMOVAL OF A PRINCIPLE THREAT FROM THE SITE, BUT NOT FOR REMEDIATION OF CONTAMINATED GROUNDWATER. IT DOES NOT SATISFY THE STATUTORY PREFERENCE FOR TREATMENT FOR THE MAXIMUM EXTENT PRACTICABLE.

ALTERNATIVES 3, 4 AND 5 DIFFER PRINCIPALLY IN THE RANGE OF PRETREATMENT PROVIDED FOR CONTAMINATED GROUNDWATER BEFORE RELEASE TO THE SALISBURY POTW. ALTERNATIVE 3, PROVIDES FOR NO PRETREATMENT WHICH ALLOWS NO FLEXIBILITY SHOULD THE SALISBURY POTW BENCH-SCALE TEST (SEE DISCUSSION ON ALTERNATIVE 3) INDICATE THAT PRETREATMENT WOULD BE NECESSARY FOR DISCHARGE OF THE GROUNDWATER DIRECTLY TO THE POTW. THEREFORE, THIS ALTERNATIVE MAY FAIL TO MEET THE REMEDIATION GOALS SPECIFIED WITHIN THE ROD. ALTERNATIVE 4, PROVIDES FOR DISCHARGE TO THE POTW OR GRANTS CREEK AFTER PRETREATMENT, AND IS EQUIVALENT TO ALTERNATIVE 5 IN PROTECTIVENESS. HOWEVER, ALTERNATIVE 5, WHICH SPECIFIES PRETREATMENT AS NECESSARY WITH DISCHARGE TO SALISBURY POTW DOES NOT REQUIRE AN ADDITIONAL NPDES PERMIT.

6.2 DESCRIPTION OF RECOMMENDED REMEDY

THE RECOMMENDED ALTERNATIVE (ALTERNATIVE 5) FOR REMEDIATION OF GROUNDWATER IS TO INSTALL A GROUNDWATER INTERCEPTION AND EXTRACTION SYSTEM DOWNGRADIENT OF THE SOURCE AREA(S).THE LEVEL AND DEGREE OF PRETREATMENT OF THE EXTRACTED GROUNDWATER WILL DEPEND ON THE EFFLUENT LIMITS SET BY THE POTW.THE RANGE OF PRETREATMENT FOR THE EXTRACTED GROUNDWATER INCLUDES AIR STRIPPING, FILTRATION THROUGH ACTIVATED CARBON FILTER, METAL REMOVAL, AND TREATMENT THROUGH THE COMPANY,S EXISTING LAGOON SYSTEM. THE EXTRACTED GROUNDWATER WILL BE DISCHARGED TO THE SALISBURY POTW. GROUNDWATER REMEDIATION WILL BE PERFORMED UNTIL ALL CONTAMINATED WATER MEETS CLEANUP GOALS SPECIFIED IN SECTION 4 THROUGHOUT THE PLUME AREA(S).

IN THE POSSIBILITY THAT A MUTUAL ARRANGEMENT CANNOT BE REACHED BETWEEN NATIONAL STARCH & CHEMICAL CORPORATION AND THE POTW TO ACCEPT THE EXTRACTED GROUNDWATER, TREATED OR UNTREATED, THE EXTRACTED GROUNDWATER WILL BE DISCHARGED TO A LOCAL SURFACE STREAM UNDER A NPDES PERMIT.

A MONITORING PROGRAM WILL BE ESTABLISHED FOR SURFACE WATER AND SEDIMENT.

ADDITIONAL SOIL SAMPLES WILL BE COLLECTED IN THE VICINITY OF SURFACE WATER AND IN THE VICINITY OF ANY SUSPECTED SOURCE AREA(S) TO DETERMINE IF OTHER SOURCE(S), OTHER THAN THE TRENCH AREA, ARE RESPONSIBLE FOR THE SURFACE WATER AND SEDIMENT CONTAMINATION FOUND. THE SURFACE WATER AND SEDIMENT MONITORING WILL CONTINUE UNTIL CLEANUP GOALS HAVE BEEN MET.

THE RECOMMENDED ALTERNATIVE MEETS THE REQUIREMENTS OF THE NATIONAL OIL AND HAZARDOUS SUBSTANCES CONTINGENCY PLAN (NCP), 40 CFR 300.68 (J), AND THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 (SARA).THIS REMEDY PERMANENTLY AND SIGNIFICANTLY REDUCES THE POTENTIAL THREAT DUE TO GROUNDWATER CONTAMINATION AT THE SITE THROUGH REDUCTION OF TOXICITY, MOBILITY, AND VOLUME OF CONTAMINANTS, AND UTILIZES TREATMENT TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE FOR THIS OPERABLE UNIT.

6.4 COST OF RECOMMENDED ALTERNATIVE

CAPITAL COSTS FOR GROUNDWATER REMEDIATION IS $597,000 WITH SYSTEM OPERATING AND MAINTENANCE COST AT $55,000 PER YEAR, WHICH INCLUDES SAMPLING AND ANALYSIS.THE TOTAL PRESENT WORTH OF THE GROUNDWATER REMEDIATION IS $1,001,000.

6.5 SCHEDULE

THE PLANNED SCHEDULE FOR REMEDIAL ACTIVITIES AT THE NATIONAL STARCH SITE WILL BE GOVERNED BY THE SIGNING OF THE CONSENT DECREE AND THE FINALIZATION OF THE SITE ON THE NPL, BUT TENTATIVELY IS AS FOLLOWS:

SEPTEMBER 1988- APPROVE RECORD OF DECISION
JANUARY 1989- SIGN CONSENT DECREE
FEBRUARY 1989- BEGIN REMEDIAL DESIGN

JULY 1989- COMPLETE REMEDIAL DESIGN
AUGUST 1989- BEGIN MOBILIZATION

6.6 FUTURE ACTIONS

GROUNDWATER, SURFACE WATER AND SEDIMENT MONITORING WILL BE REQUIRED THROUGHOUT THIS REMEDIAL ACTION TO MONITOR THE ACHIEVEMENT OF CLEANUP GOALS. A SUPPLEMENTAL RI (REMEDIAL INVESTIGATION) CONSISTING OF SOIL SAMPLING TO IDENTIFY ADDITIONAL SOURCE AREA(S) AND ASSOCIATED PATHWAYS FOR SURFACE WATER AND SEDIMENT CONTAMINATION WILL BE INITIATED DURING REMEDIAL DESIGN. A SUBSEQUENT SOURCE CONTROL OPERABLE UNIT ADDRESSING SOILS, AND AS NECESSARY, SEDIMENTS, WILL PROVIDE FURTHER SITE REMEDIATION TO ADDRESS ANY PRINCIPAL THREAT FROM INGESTION OF OR DERMAL CONTACT WITH CONTAMINATED SOILS OR SEDIMENTS.

6.7 CONSISTENCY WITH OTHER ENVIRONMENTAL LAWS

REMEDIAL ACTIONS PERFORMED UNDER CERCLA MUST COMPLY WITH ALL APPLICABLE OR RELEVANT AND APPROPRIATE FEDERAL AND STATE ENVIRONMENTAL REGULATIONS.

ALL ALTERNATIVES CONSIDERED FOR THE NATIONAL STARCH SITE WERE EVALUATED ON THE BASIS OF THE DEGREE TO WHICH THEY COMPLIED WITH THESE REGULATIONS. THE RECOMMENDED ALTERNATIVE WAS FOUND TO MEET OR EXCEED ALL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS AS DISCUSSED BELOW:

- CLEAN WATER ACT

CONTAMINATION WAS DETECTED IN SURFACE WATER AND SEDIMENT SAMPLES ON-SITE.

- SAFE DRINKING WATER ACT

MAXIMUM CONTAMINANT LEVELS (MCLS) ESTABLISHED UNDER THE SAFE DRINKING WATER ACT WERE FOUND TO BE RELEVANT AND APPROPRIATE TO REMEDIAL ACTION AT THE NATIONAL STARCH SITE. THE CLEANUP GOALS FOR GROUNDWATER WERE ESTABLISHED IN SECTION 4.

- ENDANGERED SPECIES ACT

THE RECOMMENDED REMEDIAL ALTERNATIVE IS PROTECTIVE OF SPECIES LISTED AS ENDANGERED OR THREATENED UNDER THE ENDANGERED SPECIES ACT. REQUIREMENTS OF THE INTERAGENCY SECTION 7 CONSULTATION PROCESS, 50 CFR, PART 402, WILL BE MET. THE DEPARTMENT OF THE INTERIOR, FISH AND WILDLIFE SERVICE WILL BE CONSULTED DURING REMEDIAL DESIGN TO ASSURE THAT ANY ENDANGERED OR THREATENED SPECIES ARE NOT ADVERSELY IMPACTED BY IMPLEMENTATION OF THIS REMEDY.

- CLEAN AIR ACT (AMBIENT AIR QUALITY STANDARDS)

THE GROUNDWATER TREATMENT SYSTEMS WILL BE DESIGNED AND MONITORED TO ASSURE THAT AIR EMISSIONS MEET ALL LOCAL, STATE AND FEDERAL STANDARDS.

7.0 COMMUNITY RELATIONS

FACT SHEETS WERE TRANSMITTED IN FEBRUARY 1987, TO INTERESTED PARTIES, RESIDENTS NEAR THE SITE, MEDIA AND STATE, LOCAL AND FEDERAL OFFICIALS BEFORE THE RI WORK BEGAN AT THE SITE.

AN INFORMATION REPOSITORY WAS ESTABLISHED AT THE ROWAN COUNTY LIBRARY IN SALISBURY, NORTH CAROLINA.

A PUBLIC MEETING WAS HELD ON APRIL 2, 1987, AT THE CIVIC CENTER IN SALISBURY TO DISCUSS THE

RI/FS ACTIVITIES AND TO INTRODUCE SUPERFUND TO THE COMMUNITY.

ANOTHER PUBLIC MEETING WAS HELD ON MARCH 31, 1988, AT THE CIVIC CENTER IN SALISBURY TO DISCUSS THE RESULTS OF THE RI.

THE FINAL PUBLIC MEETING WAS HELD ON SEPTEMBER 14, 1988, AT THE CIVIC CENTER IN SALISBURY TO DISCUSS THE ALTERNATIVES FROM THE FEASIBILITY STUDY AND DESCRIBE EPA'S PREFERRED REMEDIAL ALTERNATIVE. THE THREE-WEEK PUBLIC COMMENT PERIOD ENDED ON SEPTEMBER 24, 1988.THE PROPOSED PLAN FACT SHEET WAS DISTRIBUTED TO THE PUBLIC, INCLUDING THE INFORMATION REPOSITORY, IN SEPTEMBER 1988.

A RESPONSIVENESS SUMMARY HAS BEEN PREPARED TO SUMMARIZE COMMUNITY CONCERNS AND EPA'S COMMUNITY RELATIONS ACTIVITIES.

TABLE 1

SURFACE WATER/SEDIMENT ORGANIC ANALYTICAL DATA SUMMARY
NATIONAL STARCH AND CHEMICAL CORPORATION RI/FS
DATE OF SAMPLING - MARCH 1987

1,2-DICHLORO-BUTYLBENZYL-METHYLENE ACETONEETHANEPHTHALATE(A)

SE1-44(7) 18(7) -
SW1- - 1400(50) -
SE2 8(7)65(7)--
SW2- - --

SE3- - -1800(440)
SW3- - --
SE4-42(8)-1500(520)
SE5-33(9)--

SE6-50(6)-1000(410)
SW6- - --

SE108(6)29(6)--
SW10 - - --
SE11 - 116(6)--
SW11 - - --
SE12 -18(7)--
SW12 - - --

(A)SUSPECTED OF REPRESENTING SAMPLING ERROR.
SE - UG/KG
SW - UG/L
() REPRESENTS DETECTION LIMIT

TABLE 1 (CONTINUED)

SURFACE WATER/SEDIMENT ORGANIC ANALYTICAL DATA SUMMARY NATIONAL STARCH AND CHEMICAL CORPORATION RI/FS
DATE OF SAMPLING - MARCH 1987

	BIS(2-ETHYLHEXYL)-DI-N-BUTYL-PHTHALATE(A)PHTHALATE(A)
SE1	-
SW1	-
SE2	-
SW2	-
SE33200(440)	-
SW3	-
SE43400(520)	-
SW4	-
SE52700(410)	-
SE6	-
SW6	-
SE10-449(430)	
SW10	-
SE11	-
SW11	-
SE12	-
SW12	-

(A)SUSPECTED OF REPRESENTING SAMPLING ERROR.
SE - UG/KG
SW - UG/L
() REPRESENTS DETECTION LIMIT

TABLE 2
ANALYTICAL DATA SUMMARY - SEDIMENT SAMPLES
NATIONAL STARCH AND CHEMICAL CEDAR SPRINGS ROAD SITE
ROWAN COUNTY, NORTH CAROLINA
JUNE 17, 1987

NS-S3	NS-S4	
CONTROL FENCE		
06/17/87	06/17/87	
1700	1735	
INORGANIC ELEMENT/COMPOUND	MG/KG	MG/KG
BARIUM	40	49
CHROMIUM	31	71
COPPER	34	62
NICKEL	7.5	--
STRONTIUM	14	13
TITANIUM	520	860
VANADIUM	140	240
YTTRIUM	16	7.8
ZINC	18	43
ALUMINUM	11000	22000
MANGANESE	150	640
CALCIUM	1300	1300
MAGNESIUM	6101	000
IRON	22000	61000
EXTRACTABLE ORGANIC COMPOUNDS	UG/KG	UG/KG
HEXACHLOROBUTADIENE	--	400J
BENZOIC ACID	520J	--
PETROLEUM PRODUCT N	--	
2 UNIDENTIFIED COMPOUNDS	--	3000J
BIPHENYL	--	100JN
BIS(PHENYLMETHYL)BENZENEMETHANAMINE	--	700JN
DIPHENYLETHANEDIONE	--	200JN
HEXADECANOIC ACID	1000JN	900JN
OXYBISBENZENE	--	200JN
PURGEABLE ORGANIC COMPOUNDS	UG/KG	UG/KG
1,2-DICHLOROETHANE	--	3400JN

FOOTNOTES
J - - ESTIMATED VALUE
N - PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
--- MATERIAL WAS ANALYZED FOR BUT NOT DETECTED

TABLE 2 (CONTINUED)
ANALYTICAL DATA SUMMARY - SEDIMENT SAMPLES
NATIONAL STARCH AND CHEMICAL CEDAR SPRINGS ROAD SITE
ROWAN COUNTY, NORTH CAROLINA
JUNE 17, 1987

NS-S2NS-S1		
AIRPORTMENSTER		
ROAD PROPERTY		
06/17/87	06/17/87	
1545	1420	
MG/KGMG/KG		
INORGANIC ELEMENT/COMPOUND		
BARIUM37	52	
CHROMIUM58	44	
COPPER30	21	
NICKEL--	--	
STRONTIUM 17	13	
TITANIUM590550		
VANADIUM14098		
YTTRIUM 6.85.7		
ZINC22	23	
ALUMINUM100008500		
MANGANESE 470490		
CALCIUM 3900	2500	
MAGNESIUM 2200	1900	
IRON3400025000		
EXTRACTABLE ORGANIC COMPOUNDS UG/KGUG/KG		
HEXACHLOROBUTADIENE --	--	
BENZOIC ACID--	--	
PETROLEUM PRODUCT --	--	
2 UNIDENTIFIED COMPOUNDS--	--	
BIPHENYL--	--	
BIS(PHENYLMETHYL)BENZENEMETHANAMINE --	--	
DIPHENYLETHANEDIONE --	--	
HEXADECANOIC ACID --	--	
OXYBISBENZENE --	--	
PURGEABLE ORGANIC COMPOUNDS UG/KGUG/KG		
1,2-DICHLOROETHANE--	--	

****

FOOTNOTES
J - - ESTIMATED VALUE
N - PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
--- MATERIAL WAS ANALYZED FOR BUT NOT DETECTED

TABLE 2 (CONTINUED)
ANALYTICAL DATA SUMMARY - SEDIMENT SAMPLES
NATIONAL STARCH AND CHEMICAL CEDAR SPRINGS ROAD SITE
ROWAN COUNTY, NORTH CAROLINA
JUNE 17, 1987

	NS-S3	NS-S4
	CONTROL	FENCE
	06/17/87	06/17/87
	1655	1730
INORGANIC ELEMENT/COMPOUND	UG/L	UG/L
BARIUM	32	21
STRONTIUM	63	110
TITANIUM	40	--
VANADIUM	15	--
ALUMINUM	3100	230
MANGANESE	200	160
	MG/L	MG/L
CALCIUM	6.8	13
MAGNESIUM	3.3	5.4
IRON	3.5	1.1
SODIUM	4.2	13
EXTRACTABLE ORGANIC COMPOUNDS	UG/L	UG/L
ETHYLHEXANOIC ACID	--	4JN
PHOSPHORIC ACID, TRIETHYL ESTER	--	25JN
(DIMETHYLETHYL) PROPENAMIDE	--	3JN
(DIMETHYLETHYL) PROPENAMIDE (2 ISOMERS)	---	--
1 UNIDENTIFIED COMPOUND	--	100JN
PURGEABLE ORGANIC COMPOUNDS	UG/L	UG/L
1,2-DICHLOROETHANE	--	4400J

FOOTNOTES
J - - ESTIMATED VALUE
N - PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
--- MATERIAL WAS ANALYZED FOR BUT NOT DETECTED

TABLE 2 (CONTINUED)
ANALYTICAL DATA SUMMARY - SEDIMENT SAMPLES
NATIONAL STARCH AND CHEMICAL CEDAR SPRINGS ROAD SITE
ROWAN COUNTY, NORTH CAROLINA
JUNE 17, 1987

NS-W2NS-W1		
AIRPORTMENSTER		
ROAD PROPERTY		
06/17/87 06/17/87		
1539 1402		
INORGANIC ELEMENT/COMPOUNDUG/L UG/L		
BARIUM46 47		
STRONTIUM 310280		
TITANIUM-- --		
VANADIUM-- --		
ALUMINUM200210		
MANGANESE -- --		
MG/L MG/L		
CALCIUM 31 28		
MAGNESIUM 13 12		
IRON0.39 0.31		
SODIUM9.69.2		
EXTRACTABLE ORGANIC COMPOUNDS UG/L UG/L		
ETHYLHEXANOIC ACID-- --		
PHOSPHORIC ACID, TRIETHYL ESTER -- --		
(DIMETHYLETHYL) PROPENAMIDE 20JN --		
(DIMETHYLETHYL) PROPENAMIDE--- 20JN		
(2 ISOMERS)		
1 UNIDENTIFIED COMPOUND 50J40J		
PURGEABLE ORGANIC COMPOUNDS UG/L UG/L		
1,2-DICHLOROETHANE-- --		

FOOTNOTES
J - - ESTIMATED VALUE
N - PRESUMPTIVE EVIDENCE OF PRESENCE OF MATERIAL
--- MATERIAL WAS ANALYZED FOR BUT NOT DETECTED

TABLE 4

HAZARDOUS SUBSTANCES FOUND IN THE GROUNDWATER AT THE NATIONAL STARCH SITE

	HIGHEST CONC.	10(-6) EXCESS
CARCINOGENS FOUND ON SITE		CANCER RISKS
ARSENIC	310 PPB	0.02 PPB
BENZENE	8 PPB	1.2 PPB
BIS(2-CHLOROETHYL) ETHER	14,000 PPB	0.03 PPB
BROMODICHLOROMETHANE	7 PPB	0.43 PPB
CHLOROFORM	49 PPB	0.43 PPB
1,2-DICHLOROETHANE	350,000 PPB	0.38 PPB
1,1-DICHLOROETHYLENE	11 PPB	0.06 PPB
METHYLENE CHLORIDE	8 PPB	5.0 PPB
1,1,2-TRICHLOROETHANE	11 PPB	0.59 PPB
TRICHLOROETHYLENE	10 PPB	3.0 PPB
VINYL CHLORIDE	90 PPB	0.02 PPB

	HIGHEST CONC.	CONC.EQUIV.
NON-CARCINOGENS FOUND ON SITE		TO RFD OR ACI
ACETONE	89,000 PPB	3,500 PPB
BARIUM	2,290 PPB	1,800 PPB
BERYLLIUM	120 PPB	17.5 PPB
CADMIUM	114 PPB	10 PPB
CHROMIUM	554 PPB	175 PPB
1,2-DICHLOROPROPANE	29,000 PPB	6 PPB
ETHYL BENZENE	1,500 PPB	3,500 PPB
MANGANESE	1,400,000 PPB	7,700 PPB
NICKEL	5,190 PPB	350 PPB
4-NITROPHENOL	13,000 PPB	350 PPB
SELENIUM	274 PPB	105 PPB
TOLUENE	6,000 PPB	2,000 PPB
XYLENES	3,800 PPB	350 PPB
ZINC	14,900 PPB	7,350 PPB

* = PROPOSED MAXIMUM CONTAMINANT LEVEL GOAL (MCLG)

TABLE 4 (CONTINUED)

HAZARDOUS SUBSTANCES FOUND IN THE GROUNDWATER AT THE NATIONAL STARCH SITE

CURRENT CARCINOGENS	MCL
ARSENIC	10 PPB
BENZENE	5 PPB
BIS(2-CHLOROETHYL) ETHER	NONE
BROMODICHLOROMETHANE	NONE
CHLOROFORM	NONE
1,2-DICHLOROETHANE	5 PPB
1,1-DICHLOROETHYLENE	7 PPB
METHYLENE CHLORIDE	NONE
1,1,2-TRICHLOROETHANE	NONE
TRICHLOROETHYLENE	5 PPB
VINYL CHLORIDE	2 PPB

CURRENT NON-CARCINOGENS	MCL
ACETONE	NONE
BARIUM	1,000 PPB
BERYLLIUM	NONE
CADMIUM	10 PPB
CHROMIUM	50 PPB
1,2-DICHLOROPROPANE	6 PPB*
ETHYL BENZENE	680 PPB*
MANGANESE	NONE
NICKEL	NONE
4-NITROPHENOL	NONE
SELENIUM	10 PPB
TOLUENE	2,000 PPB*
XYLENES	400 PPB*
ZINC	NONE

* = PROPOSED MAXIMUM CONTAMINANT LEVEL GOAL (MCLG)